DOCUMENT RESUME

ED 329 013 EA 022 748

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TITLE The Biggest Bang for the Buck: A Further Investigation of Economic Efficiency in the Public Schools of Illinois. MacArthur/Spencer Series Number 16.
INSTITUTION Illinois State Univ., Normal. Center for the Study of Educational Finance.
SPONS AGENCY John D. and Catherine T. MacArthur Foundation, Chicago, IL.; Spencer Foundation, Chicago, Ill.
PUB DATE Sep 90
NOTE 46p.
PUB TYPE Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Cost Effectiveness; *Educational Finance; Elementary Secondary Education; *Productivity; Public Schools; *School District Spending; Statistical Analysis
IDENTIFIERS *Illinois

ABSTRACT

This study presents a new approach to identifying economically efficient school districts in Illinois and provides a preliminary analysis of the determinants of public schools' economic efficiency. Economically efficient schools are those attaining higher than expected test scores at lower than expected costs. Expectation is based on school district socioeconomic status and property wealth. Using the quadriform procedure, which combines two related data sets to produce a visual representation, 75 K-12 Illinois districts were identified as economically efficient. The study differentiates between the concepts and goals of economic efficiency and professional effectiveness. Numerous internal budget ratios in school districts failed to discriminate between economically efficient and inefficient districts. Generally, characteristics beyond local superintendent and board control contributed more to determining economic efficiency than factors under administrative control. Some partially controllable factors do seem to affect economic efficiency, such as district size and pupil transportation investment. Other administratively controlled variables are listed. Since so many factors are outside administrative control, districts' economic-efficiency status may simply be fortuitous. Included are six pages of suggested readings and six appendices containing survey data. (MLH)

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ED329013

Center for the Study of Educational Finance

Department of Educational Administration and Foundations

College of Education and the Graduate School

Illinois State University, Normal, Illinois

The MacArthur/Spencer Special Series on Illinois School Finance

MacArthur/Spencer Series Number 16:

THE BIGGEST BANG FOR THE BUCK: A FURTHER INVESTIGATION OF ECONOMIC EFFICIENCY IN THE PUBLIC SCHOOLS OF ILLINOIS

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September 1990

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This series of monographs is dedicated to Professor Lucy Jen Huang Hickrod, late of the Sociology Department of Illinois State University. Death has forever taken Professor Huang Hickrod from intellectual labors, but she remains an inspiration to her husband, her family and her many friends. *Sic transit Gloria Mundi.*

ABSTRACT

This study presents a means of identifying economically-efficient school districts in Illinois and provides a preliminary analysis of the determinants of economic efficiency in the public schools (K-12). Economically-efficient schools are identified as schools which attain higher than expected test scores at lower than expected costs. Expectation is based upon the socioeconomic status of the school districts and the property wealth of the school districts. Using this procedure, 75 K-12 districts in Illinois are identified in this study as economically-efficient. The study stresses the difference between the concepts and goals of economic efficiency on the one hand, and professional effectiveness on the other hand.

A number of internal budget ratios in school districts failed to discriminate between economically-efficient school districts and economically-inefficient school districts. In general, characteristics beyond the control of local superintendents and local boards contributed more to the determination of economic efficiency than did factors under the control of the superintendents and the boards. Some, at least partially controllable factors, however, do seem to contribute to economic efficiency and, therefore, deserve further consideration. For example, middle-size districts are more economically-efficient than either very small districts or very large districts. Also, heavy investment in transporting pupils does not seem to contribute to economic efficiency, as defined in the study. The study concludes by listing a number of administratively-controllable variables that should be investigated relative to economic efficiency in Illinois. At this time, direct policy implications are limited by the fact that so many factors relating to economic efficiency do not seem to be within the control of boards and superintendents. This makes rewarding districts for economic efficiency by the state a doubtful procedure since the district's status as an economically-efficient district may simply be fortuitous, and not the result of any meritorious behavior on the part of the local school administration.

I. Introduction

The purpose of this study is to further explicate a new approach to the study of economic efficiency in the K-12 schools of the country. The study outlined here further develops an investigative technique which was first reported in publication number eleven of the MacArthur/Spencer special series on Illinois school finance. Most scholars in school finance agree that the study of economic efficiency is not in good array. Critics claim that the school finance community has paid much more attention to the goals of "equity" and "adequacy" than they have to the goal of "efficiency." That criticism is probably just. Moreover, while it can be said that economic efficiency in the public schools has not been ignored, particularly among the investigators with a more rigorous training in the discipline of economics, the problems associated with the study of economic efficiency in the public schools have proven so very thorny that they have simply discouraged many from working in this area. It is time, therefore, for a new approach to this subject, and that is the justification for this study.

First, decent respect for academic traditions requires that the limitations of the current approaches to the study of economic efficiency must be pointed out. Proposing a new method of investigating this area necessitates indicating why the usual "treatments of choice" of educational researchers has been rejected here. Therefore, the first part of this paper deals with rather grave limitations that are present in the more well-known approaches to the topic of economic efficiency in the public schools. This is followed with a conceptual statement of an approach which has been labeled, "the quadriform." This, in turn, is followed by a section which briefly reports the use of this empirical approach in two dissertations at Illinois State University and one study at the University of Michigan. Finally, the limitations of the suggested approach are outlined. Those limitations, themselves, are very weighty in nature. However, the only way to find out whether there is merit in this approach is to make it available to the larger research community and to let other researchers try the procedure to discover what limitations are inherent in it.

That such an approach comes from the Center for the Study of Educational Finance is not unexpected. Some years ago, the Center launched another experimental statistical approach upon the school finance community; e.g., the bivariate Gini Index, which has proven useful in the study of equity among school districts. It is to be hoped that the "quadriform" will provide as much discussion and investigation in the efficiency area as the bivariate Gini did in the equity area.

At the outset, this study indicates what it is not. Most assuredly, it is not a comprehensive review of the literature in the field of economic efficiency in public education. There are such reviews--rather complete ones, at that--some of which are indicated in the suggested reading section at the end of this article. Any serious student of the subject would wish to at least sample that literature, paying particular attention to the works of Hanushek, Walberg, MacPhail-Wilcox, and Monk.

II. Limitations to Existing Approaches to Economic Efficiency

There appear to be at least three major approaches to the study of economic efficiency in the public schools. These can be categorized under the headings: "production functions," "cost effectiveness" studies, and "cost-benefit" studies. Each will be discussed briefly only for the purpose of indicating the limitations of those approaches, at least in the view of the authors. There is a sizeable literature on each approach and, again, the reader who wishes to explore that terrain is invited to explore the suggested reading section of this study.

A. Production Function Approach

The production function approach is probably the oldest approach in school finance to economic efficiency. Essentially, the production function selects some measurement of educational output, usually the score on a standardized test given state-wide to all the school districts in the state. However, the school district does not have to be the unit of analysis. There are good examples in the literature of the individual school as the unit of analysis and even of the individual student as the unit of analysis. Almost always there are two vectors or major factors used as the "independent" variables where test scores are used as the "dependent" variable. One of these is a vector representing variables over which the administrator has little control. Also, almost always, these non-controllable variables are socioeconomic characteristics of the district and the student body in the district. The second vector is a set of variables over which the administrator is supposed to have some control. This is a very valuable division in variables. In fact, the same division was used in the "quadriform" approach which is outlined below.

However, the production function approach, as applied in education, has proven to have some major limitations. In the first place, the division of variables referred to above is not at all clear-cut. For example, frequently, an important objective of the investigation is to ascertain what effect dollars have on output; e.g., controlling for the variables over which the administrator has little or no control, What is the effect of educational spending? This question is often highlighted because of the role it plays in constitutional challenges to the K-12 finance system that have occurred over the last two decades, extending from Serrano v. Priest to the more recent cases in Montana, Texas, Kentucky, and New Jersey. Unfortunately, spending is so interlocked with socioeconomic variables that, at least to to the authors, there appears to be no direct and straightforward way to ever answer that very policy-relevant question, "What is the effect of dollars spent in education?"

If many school districts existed that were populated by high socioeconomic families, and if these high socioeconomic districts also had low spending, and if many school districts existed that were populated by low socioeconomic families, and had very high spending levels for education, then, and only then, would it be possible to answer the question of the effect of spending on outputs, such as test scores, independent of the socioeconomic level of the students who compose the district, using the standard ex post facto research designs that are readily available. But, such is not the real world in which we live. Much to the contrary, the wealthy districts in this country continue to have high spending levels and the poor districts in the United States continue to have low spending levels, and that situation prevails despite over two decades of litigation intended to reverse this very situation throughout the United States. In fact, in Illinois, previous studies published by this Center make it perfectly clear that expenditures are now more a function of local district wealth than they were over two decades ago. Moreover, a constitutional challenge, based on these fact, is being prepared at the time this monograph is being written. The reluctant conclusion drawn is: what society has put together, no statistician can render asunder. Consequently, it was decided to leave this mountain of the effect of dollars spent as not capable of being scaled--given the limitations of current research designs and statistical tools--and to approach the topic of economic efficiency from a different angle.

There are many other problems with the conventional "production function" approaches. In the first place, most of them are badly modeled. In the real world of educational finance, most things are both curvilinear and interactive. Seldom, in the current body of literature, does one find production functions studies in which the data

have been researched to the point where the true curvilinear relations of the variables being used have been found. Since linear computer programs are so readily available, the researcher usually immediately jumps to the linear assumption without exploring whether or not curves are present. Second, in the real world, educational variables are almost always in interaction with each other. Occasionally, a first order interaction will be found in some of these production functions, but almost never is a second or third order interaction explored. Usually, the production functions are simply additive and linear. Convenient, but, unfortunately, as are most convenient things, dead, wrong. The model that is needed should be curvilinear and multiplicative.

In the early production function studies, there was also an unfortunate tendency to look for some "master function" that would explain all learning for all kinds of students. The search was for a Cobb-Douglas production model that would hold in all times and in all places for all school children. Fortunately, that assumption was dropped, and more recent production function studies do tend to select target populations of students, e.g., separate production functions are sought for poor students, rich students, slow learners, gifted, etc. This is a definite improvement. Under the capable leadership of David Monk and others, the unit of analysis appears to have shifted downward from the school district to the individual school, to the individual program, and to the individual student. That, too, is an improvement. However, for state policy purposes, an analysis by school district is useful, and the "quadriform" approach does use the district as the unit of analysis. The line of research at the district level must be continued, if only to try to satisfy the legitimate questions asked by members of the state legislature, the governor's office and other decision-makers at the state level.

The production function approach--sometimes also called the "input-output" approach or, even more generically, the "econometric model" or "structural equation" approach--is not going to go away; nor should it. As David Monk has cogently pointed out, the raison d'etre for educational administration, itself, rests on the assumption that some kind of production function really does exit in education. To abandon the quest for a production function is to abandon much of the reason for training educational administrators. These are techniques that are a standard part of the working economist's tool bag. What the students of economics have been taught to use, they will use. Additionally, over the last two decades, there have been major improvements and the production function equations used now are a good deal more sophisticated that those of earlier studies. Still, even by the standards used by their economic practitioners, they do not "do" well. For example, the coefficient of net determination, e.g., the uncorrected R-squared, seldom rises to 50% of the explained variance in test scores with these models. In fact, most of the literature of this genre reports at 30 and 40 percent levels and obtains those levels of prediction only by including some very obvious variables in the independent variables.

B. The Cost Effectiveness Approach

Of much greater utility, at least to school administrators, are the studies usually grouped under the label "cost-effectiveness" investigations. Sometimes, these are also econometric models. For example, a standard approach from economics is to construct a production function equation to predict test scores, then construct a cost equation to predict costs, and then to compare the cost coefficients with the production coefficients. The difficulty is that the cost equation predicts rather well, usually at around the 80% level, while the production function equation may drag in at about 30%. Pairing two equations, one of which predicts twice as well as another, is a doubtful approach.

Cost-effectiveness studies do not have to be cast up in terms of econometric equations. It is possible to run orthodox school effectiveness studies, determine which educational treatment is more effective than other educational treatments, controlling for intervening variables, and then proceed to cost-out the price of each of the educational treatments. This is a perfectly valid approach; it is a pity that there are not more examples in the educational literature of this simple technique.

It is instructive to ask why there are not more examples of this sort of design in the educational literature. The answer probably is that the educational profession, as a whole, does not make a clear distinction between educational effectiveness, on the one hand, and economic efficiency, on the other hand. If more cost-effectiveness studies were run, researchers would be forced to face this distinction more often than they are, presently. This is true because the outcome of many of these cost-effectiveness studies is to show that even with, say, four treatments--"A," "B," "C," and "D"--it may well be that "A" is the most professionally effective, but that "D" is the most economically-efficient. When this occurs, educators are confronted with an ethical dilemma that they do not want to face. The same is true in other professions as well. For example, the medical doctor, who knows very well what the implications are of not doing an expensive surgery, and the lawyer, who really wants to work on a pro bono case, but has to meet his financial responsibilities to his firm and to his family, are not happy folk. You can't really expect professional educators to want voluntarily to join this unhappy club. But, professional educators must join the rest of the dissatisfied world, because, at least in public education, they are using the taxpayers funds; therefore, they must search not only for the most professionally efficient way to teach, but also for the most economically-efficient way to teach.

In addition, there are many problems with cost-effectiveness designs. For one thing, they seem to work best only when the output is very narrowly defined. For example, a cost-effectiveness study of three ways of teaching mathematics is apt to succeed because, if there is no significant difference between the three methods of teaching mathematics, that fact alone will indicate that the cheapest method of teaching should be used to obtain economic efficiency in the public schools. But, the public asks for more than that. They ask for some determination of the economic efficiency of the public schools over a whole range of outputs other than simply the teaching of mathematics, science, foreign language, or whatever are the separate and discreet outputs of public education. Here cost-effectiveness studies will probably fail. There are some rare situations in which a more global output can be evaluated by cost-effectiveness approaches. Suppose a school has been ordered to present a racial integration plan--and not just to present that integration plan, but to discover a plan that would bring about the most integration at the least cost--then the cost-effectiveness approach may work. Unfortunately, in education there is sometimes a direct linear relationship between cost and effectiveness; e.g., the most expensive teaching technique is also the most effective technique; in that case, no cost-effectiveness investigation will work very well. On the whole, however, cost-effectiveness approaches do not tend to answer global questions about school accountability to the general public. They are much more useful at the local level to evaluate teaching alternatives. It is therefore to accounted a professional weakness that they are not more widely used in Colleges of Education that train teachers and administrators.

C. Cost-Benefit Studies

Not a great deal will be said here about cost-benefit studies. These rate-of-return studies very quickly move one out of the realm of educational or school finance and into the realm of the economics of education. To be sure, these two academic areas overlap

greatly; and they should probably overlap even more than they do. However, cost-benefit studies are really not directed so much toward school administrators, either state or local, as they are toward policy-makers at the national and state levels. While the results of a cost-effectiveness study can be used by a local school board or by a local school superintendent, more often the findings of cost-benefit study are used by national and state legislators to defend the allocations of public funds to the educational sector. This is a worthwhile undertaking, to which professional economists almost automatically turn.

The recent cost-benefit study by Card and Krueger also suggests that while school characteristics may not be highly correlated with test scores, they may be correlated with weekly earnings of public school graduates. Those authors argue that earnings are just as important as test scores; and, if school variables--like pupil-teacher ratio and teacher salaries--can be shown to be valid predictors of weekly earnings, those facts are as important for policy purposes as any lack of relationship between test scores and school variables.

Both critics and supporters of the human capital approach can be found in the pages of most economic journals and a full exposition of that interesting, but complicated, intellectual operation is far beyond the bounds of this study. At the same time, one cannot resist from adding "two-cents-worth" to the argument. It is often unclear just which public policy-makers the rate-of-return people have in mind when they report their results. If education were a centrally-financed function, as it is in many countries of the world other than the USA, then the answer would be simple: the rate of return results are directed to the Prime Minister and the party in power. But, in the United States, the investment decisions in education are made by 50 states and thousands of individual public schools. Presume that a rate-of-return is known. If it is thought to be high enough to merit more investment, no single central authority in the United States can make the decision to increase the investment. Or, if it is thought to be too low, similarly, no single authority can make the decision to decrease the investment in education. Our decentralized system of education may be lauded for many strengths--which it may or may not possess--but, that such a highly decentralized system can rationally respond to a known rate of return is doubtful. So, even cost-benefit studies are not without their problems, as well, at least in the public policy sphere.

III. The Concept of a Quadriform

What must be stated at the onset of an explanation of the quadriform is that it is a tool devised to portray a somewhat abstract situation. In using the quadriform, two related sets of data, pertinent to a particular case, can be combined to produce a visual representation, locating that case in relation to other related cases. In the first instance, therefore, the quadriform is nothing but a taxonomic or classification system.

The concept of a quadriform does start from the same structural equations used in other econometric studies of school finance. For example, both cost and short-form production functions are used. Also used is the notion of division of variables into those that are controllable by local schools and those that are not so controllable. However, there is a major difference in the manner that these statistical techniques are applied. The researcher is not interested in simply fitting in demand equations, nor in fitting in cost equations, for themselves. Rather, economic efficiency is being sought. The crucial research question is, "What could be a solid operational definition of economic efficiency for a public school district?" Suppose the answer is that a district is economically-efficient if, and only if, it obtains higher than expected test scores at lower

than expected costs. Then a shortened production function can be used to predict the test scores that would be expected in a school district given certain school district characteristics over which the district has little control. The shortened cost equation can also be used to predict expenditures from variables over which, again, the local school board has little control. Now, there are two sets of residuals: one from the productivity equation and one from the cost equation. Comes now a large and unorthodox leap of faith. Suppose it is assumed that what is left in the residuals is not all random or error variance, which is the usual statistical approach; but, rather, it is postulated that there exists within this joint residual variance a meaningful pattern, which neither the cost equation nor the productivity equation, acting alone, has been able to capture. If that major, admittedly somewhat unorthodox, assumption is true, it should be possible to combine the two residuals in such a manner as to give an empirical expression to the statement, "A school district is efficient if it has higher than expected test scores and lower than expected costs." If that major assumption is not true, then we are very probably merely combining random error with random error.

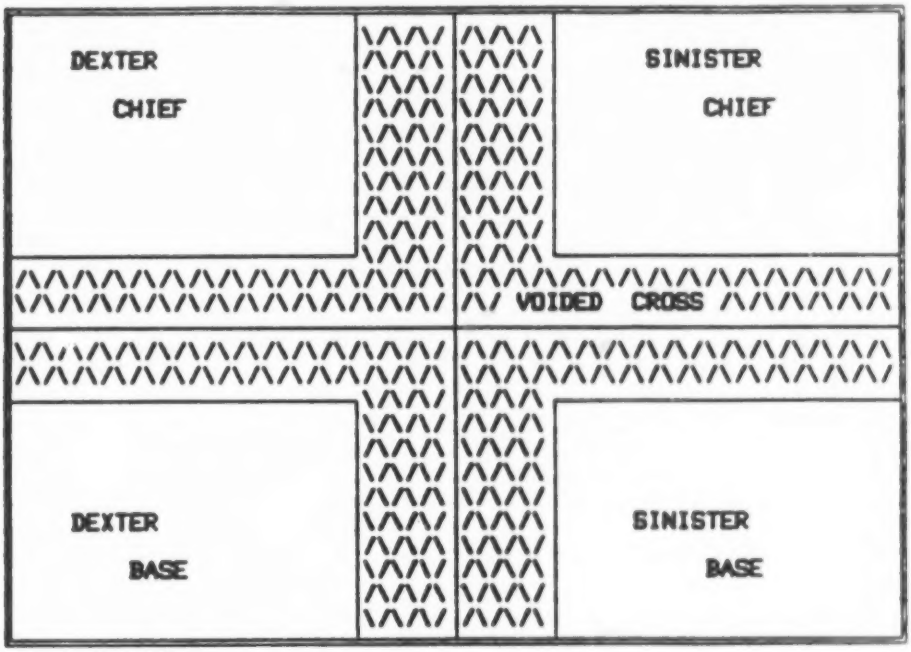


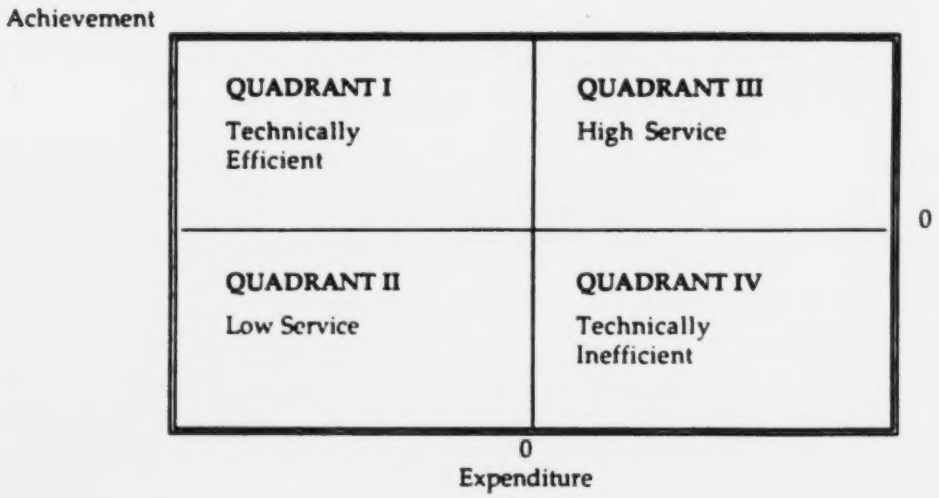
Figure 1. Heraldic Representation, Educational Finance Quadriform

Figure 1 shows the interesting design that emerges when the residuals from the two equations are paired. It looks very much like an ancient heraldic shield with a so-called "first charge" (a cross) upon it. In the upper left hand corner are found districts with the desired higher than expected test scores, and lower than expected costs. These are considered to be economically-efficient. In the upper right hand corner are districts with both higher than expected test scores and higher than expected costs. Since it cannot be assumed that all output has been captured by the test scores, these districts are designated as "high service level districts." In the lower left quadrant are the lower than expected test score districts and the lower than expected cost districts. By the same assumption, these are designated as "low service level districts." The districts in the lower left part of the design are frugal districts, but they are not very productive districts--not at least as they have been measured by productivity (from state wide standardized test scores). Finally, in the lower right hand corner of the design, in an area of the shield that ancient heraldry would have called the "sinister base" (sometimes history does come to the aid of quantitative researchers), there are districts that have lower than expected test scores and also higher than expected costs. These districts are termed economically inefficient, if the empirical definitions are accepted.

But, what about the "first charge," the cross in the design? Technically, heraldry would hold that area to be a "voided" cross since it is empty of information. Again, that is an appropriate term, since it is the area of the design that is established by the error of estimate in the two structural equations that created the residuals. This much of the space is considered to be filled with error variance or "noise." This cross can be large or small depending on whether a full standard error of estimate is selected or whether a part of a standard error of estimate is selected. After some ad hoc experimentation, one-half of a standard error of estimate was slected as being sufficient to guard against random error in the residuals. That is arbitrary, but there is a second procedure which, hopefully, will also help to rule out random error or "noise" in the residuals.

It is assumed that there will be a great deal of random error in these residuals from year-to-year. The unit district in question might possibly remain at a particular position relative to other districts and the regression equations might possibly change. The change in the regression lines would then give a misleading idea that the district is now located in a different quadrant when, in actuality, its position relative to other districts really should not have changed. Therefore, a four-year average of each individual variable used was calculated. The resulting average values were used in the computation of the desired statistics. In so doing, <u>all</u> unit districts in the state would be included in the study; the sample becomes the entire population.

The great advantage of the quadriform is that it forces one to make a conscious and deliberate distinction between "professional effectiveness" and "economic efficiency." This is its principal strength, and, from the point of view of many professional educators, it is very probably its principal weakness as well, as will be detailed below. In a sense, any public school with an average test score greater than expected, based on factors not under the immediate control of the administration of the district--these are usually socioeconomic characteristics of the district--could be considered an "effective" school. Such school districts are simply doing better than any one has any right to expect them to do, given the socioeconomic characteristics of their students. But, these may be "effective" schools at costs which are not acceptable to the majority of the taxpayers. They may be acceptable to professional educators, but to no one else.



Horizontal Axis:	Standardized Deviation from the Expected District Operating Expenditure per Pupil
Vertical Axis:	Standardized Deviation from the Composite ACT Score
Quadrant I	Lower than expected Average Expenditure per Pupil Higher than expected Average ACT Composite Score
Quadrant II	Lower than expected Average Expenditure per Pupil Lower than expected Average ACT Composite Score
Quadrant III	Higher than expected average Expenditure per Pupil Higher than expected Average ACT Composite Score
Quadrant IV	Higher than expected Average Expenditure per Pupil Lower than expected Average ACT Composite Score

Figure 2. Quadriform of Educational Production

The quadriform separates "effective" schools, so defined, into two groups: (a) districts that are effective at higher than expected costs, and (b) districts that are effective at lower than expected costs. That is to say, the quadriform enforces the the ancient Scottish virtue of frugality upon the design. The schools in the desired quadrant are not only "effective," but also, they are spending less than they really could actually spend, given the wealth of the district as measured in terms of property valuation per pupil. So, a basic theoretical and normative position has been established by the quadriform: to be "effective" in the public schools is a necessary, but it is not automatically also a sufficient condition. The charge given to public school administrators is certainly to be professionally effective, but that charge includes being effective at an acceptable cost.

Efficiency thinking need not always be carried out in terms of costs or dollars spent. Physicians think in terms of benefit/risk ratios all the time. Is the benefit of a surgical procedure worth the risk to the patient? The surgery may be expensive; it can go wrong; the surgery can require additional supportive medical work, etc. For that matter, is the benefit of a simple diet worth the hassle to stay on it for long periods of time? Unless the benefit is in terms of demonstrably increased health--and not in terms of merely cosmetics--the answer may be, "No"--at least beyond a certain age where looks are less valued than at some prior point in life. There are also much more serious questions of an efficiency nature. Historically, the physician is dedicated to the continuation of life; but, if the quality of life of a patient degenerates beyond a certain level, it is difficult--perhaps it is impossible--to justify sustaining such an existence.

Educators in special education have faced those kinds of very difficult questions for generations. Is the amount spent on special education worth the benefits to the individual and to the society? That last question is especially difficult. The calculation of individual benefit is difficult enough, but even more difficult is the estimate of whether or not the benefit to the larger society is sufficient to justify the expenditure. Often, the yield to the individual is sufficient to justify the expenditure from that individual's point-of-view, but what about the yield from the societal point-of-view? Efficiency thinking can bring one to a very ancient question of political economy, "Is it the greatest good for the greatest number for which we strive?" If that is so, then what about the good of any individuals who may have to be sacrificed in the process?

Other examples of efficiency thinking also spring to mind. Lawyers have to think in terms of efficiency as well. What are the chances of a given complaint succeeding in the courts? What is the likelihood of a success of an appeal? The whole area of plea bargaining, not to mention settlements out of court, is eloquent testimony to "efficiency thinking." But, even though the medical and the legal professions must think in efficiency terms, there is ample evidence to indicate that they really prefer not to think in that logical mode. Nor, for that matter, is there very much in their professional schools which would lead them to this kind of logic. Still, the physician, probably quite properly, thinks primarily in terms of the benefits he or she can bring to the patient. The statement most physicians would prefer to make is simply, "I think I can help you." It would be rare, indeed, to find a physician who said, "I think I know an economical way to treat your problem." Given the adversarial training of most lawyers, certainly among the trial lawyers, that professional is going to be happiest with the statement, "I think we can win this one for you." Seldom would legal counsel suggest that a bargain-basement approach should be sought for a serious miscarriage of justice. Perhaps all of this is as it should be since, at the extremes, dead or disabled patients and imprisoned or impoverished clients do not exactly add luster to the professional stature of either physician or lawyer. Corny as it may seem to some, the lawyers still thinks they are officers of the court, striving for the attainment of justice; and physicians still think that

they are striving to eradicate suffering from this world. Neither of them consider themselves to be trained economists, nor would the general public want them to think like economists.

So, the professional educators must be excused, at least a bit, for not "automatically" thinking in terms of economic efficiency because the best education is not necessarily the most economically efficient education; and at least some school boards insist on the best education for their children. Now, it must be admitted that it is very hard--very hard indeed--for most business persons to understand this resistance to efficiency thinking since they are automatically inclined, if they are successful, to thinking in terms of keeping the overhead down and turning a reasonable profit, which is an easily understood form of economic-efficiency thinking. But even businesses do not always think in terms of economic efficiency. Of all the complaints registered by business, the highest on the list has to be that the public does not recognize quality when they see it. A good business may even take a smaller profit if the goods or services offered are recognized, not as a "bargain," but as a quality service. In fact, many business schools stress that the goal is not large and quick profits, but quality services offered in a specific niche in the market. At least, that is the goal if the business person expects to be a responsible part of his or her community for a long period of time. But business, unlike most professions, always has the competitive market to enforce economic efficiency. Although there is a slight tendency in the direction of "shopping" for physicians and attorneys, most consumers do not have the knowledge to do that effectively. This situation has led many to believe that the only solution to greater efficiency in the public schools is to "privatize" the operation and they advocate voucher systems and "choice" mechanisms to bring that competition motivation into the public schools. That ideological argument has been avoided here only because it was felt that, in whatever public sector is left to education in whatever society, there would still be a need to find ways to achieve economic efficiency, unless one were to abandon the public education system entirely and return to a purely private system of education. Not many critics would be willing to junk the entire public education system. As was argued in the first monograph of the MacArthur/Spencer series, to do so would make a viable system of representative government impossible. An efficient system of public education must be found because the Republic cannot long last without a public educational system that is equitably, adequately, and efficiently financed.

Can technical efficiency be reconciled to a professional point-of-view? Yes. What one needs to remember is that one is simply trying to find an economical means to a professionally- effective end. That end is still the most knowledge the educator can accomplish in a given individual in a given amount of time. Suppose one is trying to learn a difficult foreign language--let's say the Gaelic--considered by many to be among the most difficult languages in the world for a non-native speaker. There is little doubt that the more time one spends on the Gaelic, the more proficient in that language one becomes. "Tha gu dearbh, mo charidean" (For a certainty, my friends). One can try to learn it with or without audio tapes, with or without a native speaker, by taking up residence in a Gaelic-speaking area, etc. Which of these methods is the most cost effective? Also, there are difficult choices in the kinds of Gaelic to be learned. It can be argued that learning modern Irish Gaelic is more efficient than learning Scot Gaelic since so many more people in the world speak Irish Gaelic than Scot Gaelic and since there is more literature in the Irish than in the Scot Gaelic. However, that may not be a very cost effective choice if one is intending to say something at a Robert Burns dinner or to a group gathered for Highland games. Neither, would the Welsh Gaelic suffice. Furthermore, only a strong individualist would undertake the study of the Manx, Breton, or Cornish versions of the Gaelic.

This homely illustration may well illustrate a very important point. There are two quite distinct levels of public policy decision to be made in public education. One relates to the goals of the educational system and another relates to the most economically-effective means of reaching those goals. Presumably, the local board, the state department of education and the state legislature have a great deal to say about what is learned and what is taught. Presumably, also, the local school administration has the responsibility of accomplishing those goals in the most economically-efficient manner. However, investigation of the training of school administrators would not convince one that economic-efficiency training is such a highly-valued skill in educational administration programs, but that may be changing. It should be carefully noted, too, that not all local school boards assign a high priority to economic efficiency. Wealthy, suburban districts may well rank professional effectiveness above economic efficiency and administrators in such districts can be expected to accurately reflect this priority.

Regrettably, a part of the problem may be that we are not at a stage of development in education to make full use of cost-effectiveness studies. It is true that cost-effectiveness studies are best carried to completion when one already knows that certain educational or pedagogical techniques are educationally effective, and the major task is to determine which of these techniques, all of which are relatively professionally-effective, can be utilized at the lowest cost. All too often, one simply does not know which educational procedure will yield the greatest amount of learning, controlling always for factors which are not manipulable by teachers or administrators. This might be an excuse simply for not engaging in what has already been described as an uncomfortable mode of thought for professional educators, anyway. Frankly, it may be that most educators simply do not want to think in terms of cost containment, any more than most physicians or lawyers. They want to find means of teaching as much as they can, to as many people as they can, and they don't want to be concerned with costs. While they should not be faulted all that much for this stance, it simply will not work when the funds concerned are not fees charged to patients or clients, but, rather, are monies raised by the average taxpayer. What is often forgotten is that most educators are not "fee professionals"; they are professional public servants. Perhaps, in private education, one does not have this heavy responsibility. In a private school, one charges what the market (the clients) will bear, and one defends that cost in terms of a presumably superior product over what the competition will offer. But in the public sector, as opposed to the private sector, there appears to be no way to escape the responsibility of efficiency thinking. It does not have to be in the forefront of any public school administrator's mind all the time; no superintendent is required, always and in all cases, to offer a "bargain basement" education; but neither can it be ignored. In the judgment of some, it should also be a major concern for institutions seeking to train public school administrators. Clearly, the little quadriform has much more to it than first meets the eye.

The regression equaltions arrived at are as follows:

ACT Composite

$$Y = 23.23 - .004x_1 - .0002x_2 + .001x_3 + .01x_4 - .0005x_5 - .06x_6 + .03x_7 - .03x_8$$

	Beta
x_1 = Average Percent of all in District taking test	.028292
x_2 = Average Number of test takers in whole District	-.061578
x_3 = Average Percent of District in Vocational Education	.009237
x_4 = Average Percent Mobility in the District	.037343
x_5 = Average Percent Low Income Squared	-.323749
x_6 = Average Percent District Attendance	-.035932
x_7 = Average Percent of District's high school in college prep	.243511
x_8 = Average Percent Low Income Enrollment in District	-.214597

$R^2 = 0.41981$ F = 37.08265 SIGNIF F = .0000

District Operating Expenditure Per Pupil

$$Y = 2408.68 - .0002x_1 + 19.80x_2 + .011x_3$$

	Beta
x_1 = Average Interaction between Low Income and Equalized Assessed Value	-.329169
x_2 = Average Percent Low Income	.507441
x_3 = Average Equalized Assessed Value per Pupil	.898261

$R^2 = 0.42952$ F = 104.15184 SIGNIF F = .0000

Figure 3. Regression Equations

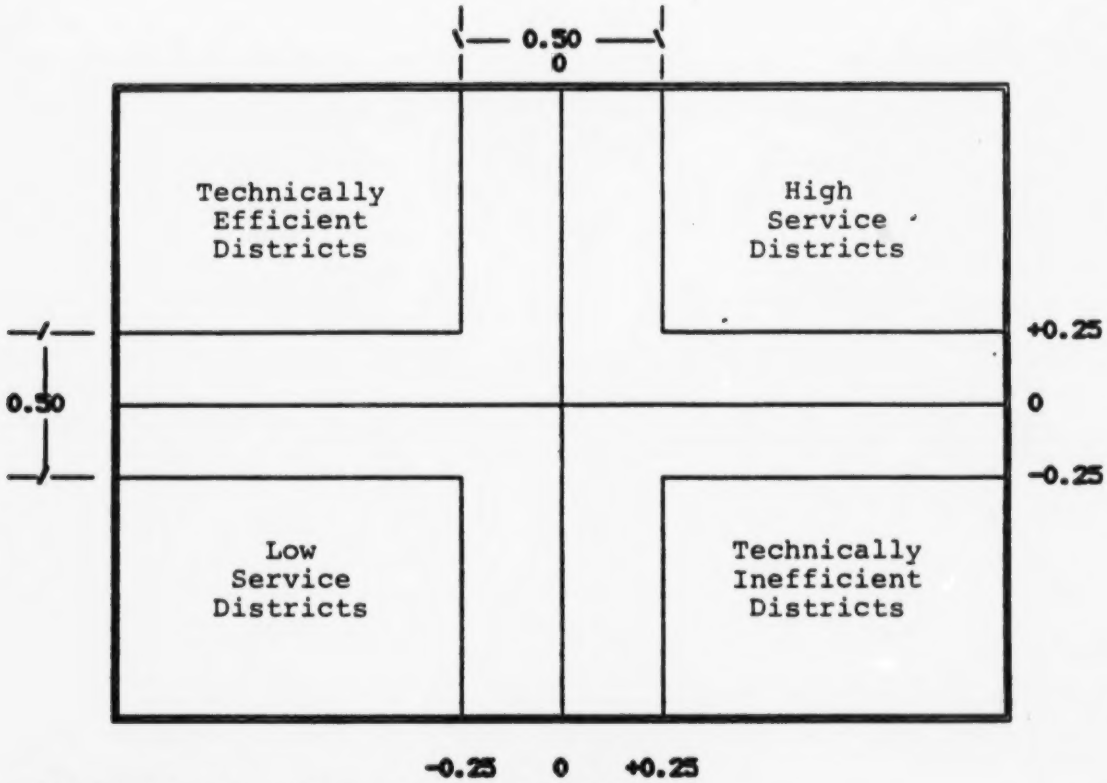
IV. The Classification Results for Illinois Unit Districts

Figure 3 shows the simple linear multiple regression equations which yielded the predicted or expected average composite ACT scores, on the one hand, and the district operating expenditures per pupil on the other hand. In the test score equation--or production function, if one thinks of the structures in those terms--some variables are entered because previous research has shown those variables to be high predictors of test scores and often beyond the control of the local school administration. For example, prior research at the Center for the Study of Educational Finance, and in a number of doctoral dissertations at Illinois State University, has shown that the percentage of children from low-income families is a powerful predictor of the test scores of a district. Not only is it known that the percentage of low income is a powerful predictor of test scores, but also it is known that this variable is curvilinear. Specifically, when the percentage of children in low-income families exceeds 50%, then the test scores in a district fall dramatically. Therefore, this variable is entered into the equation in a "squared" form. Other variables not directly under the control of the administration are also known to affect test scores--such as percent mobility in the district, percent district attendance, percent in college prep classes, percent in vocational education, etc.

Note that an attempt should also be made to control for some aspects of test-taking variations by also including the percentage of those taking the test from the total number of test takers in the district. There is assuredly nothing sacred about this particular set of production function variables. Other variables could be nominated and utilized, perhaps with greater effectiveness as prediction variables. However, an R-squared value of nearly 42% is respectable for this type of equation. Further information on the production function will not be included here because to do so would detract from the central focus of the study. Remember that, in this study, the test score equation is NOT the central focus; it is merely used to establish residuals which are, themselves, of greater interest than the predicted values. A shorter demand or expenditure equation is also shown with only two variables used to predict the expected expenditures: assessed valuation and percentage of low-income pupils. In order to enhance the prediction value, it was useful to use the interaction of the two prediction variables. Again, the prediction power is a respectable 43%. It is true that this value can be strengthened by including some of other known predictors of expenditure such as the known curvilinear relationship of size to expenditure. However, again, there was not intention to estimate the best demand or expenditure function, but merely to state a serviceable one in order to obtain the needed residuals.

Using the one-half of one standard error of estimate requirement, and the requirement that the four-year averages for the variables be used, public school districts can be identified that are economically-efficient or economically inefficient, as well as those districts that are at high service levels and those that are at low service levels. Thus, it is now known that the theoretical system will classify the districts when used on real data. The frequency count by quadrant with appropriate percentages are found in Figure 5. Further, an alphabetic listing of the 75 economically-efficient Unit School districts in Illinois, so classified by this procedure, can be found in Appendix F. That appendix may be the only part of this monograph to which a great many people will pay any attention. However, for reasons which will be explicated later in the study, this list should not be used for reward purposes. The next important step is to explore which variables might explain the placement of these districts in these quadrants. If nothing explains the placement of the districts in these quadrants, probably random error is being compared with random error and another interesting theory went up in smoke.

Quadrant	Standardized Average ACT Composite Residual	Standardized Average Operating Expenditure Residual
1	GT + 0.250	LT – 0.250
2	LT – 0.250	LT – 0.250
3	GT + 0.250	GT + 0.250
4	LT – 0.250	GT + 0.250



Horizontal Axis: Regression Line for DOEPP
Vertical Axis: Regression Line for ACT Composite

Maximum Average DOEPP = 6761.75 Std Dev = 470.27 Mean = 3197.35
Minimum Average DOEPP = 1217.75

Maximum Avg ACT Composite = 22.00 Std Dev = 1.405 Mean = 18.778
Minimum Avg ACT Composite = 9.02

Figure 4. Educational Finance Quadriform Numeric Values

The principal interest at this stage of the investigation was internal financial ratios. This was on the assumption that some internal manipulation of the budget could affect economic efficiency. To a large extent, this initial hypothesis was not sustained in this research, as is detailed below. However, it was believed that some categorical systems might identify the districts in their respective quadrants. For example, in the State of Illinois, the state school district report card, a state accountability procedure, divides the state into three geographic areas and four different community types. Both the geographic variable and the community type variable were used in the research reported here. Also used was a financial variable which James Ward used in analyzing rural and city schools: the basic education ratio which is the ratio of the per capita tuition charge to the operating expenditure per pupil.

Value Label	Value	Frequency	Percent
Technically Efficient	1	75	17.9
Low Service	2	76	18.1
High Service	3	62	14.8
Technically Inefficient	4	55	13.1
Four quadrant total		268	
In "Voided Cross" (Eliminated)	5	151	36.0
	Total	419	100.0

Figure 5. Frequency Count by Quadrant

For those readers who are interested in detailed statistical results, the relevant data can be found in the following appendices:

- Appendix A contains a table of means for the financial ratios tested by quadrant.
- Appendix B presents the ANOVA table of significance accompanied by the table of means for the variables used in the regression equations.
- Appendix C contains the follow-up tests for significant variables in the regression equations and for significance between quadrants.
- Appendix D contains the crosstabs tables for the geographic regions, community type, and basic education ratio.
- Appendix E lists all the Illinois counties with the total number of unit districts and in which quadrants they can be found.

The findings and conclusions drawn in the present monograph are contingent on the definition of technical economic efficiency as presented by the quadriform. The study could be replicated and expanded in any number of ways. Different regression equations could be used to define the quadriform. Statistical methods other than ANOVA and Chi Square could be used to investigate variables which variables are capable of identifying the districts in the four quadrants. Suggestions of this nature for further research are listed later in the study.

V. Conclusions

Based on the findings presented here, the following conclusions can be drawn in both a specific and global manner.

In the specifics the following could be arrived at. The lowest average per capita tuition charge was presented by the districts in the Low Service quadrant. Looking at the other quadrants, the High Service quadrant contains the highest average per capita tuition charge. However, economically-efficient unit school districts had the lowest average spent on transportation. Apparently, staying out of the transportation business is a major step toward economic efficiency. Very likely, this suggests that districts that cannot, for valid reasons, stay out of extensive transportation operations should pay special attention to various ways to reduce that expense, consistent, of course, with pupil safety. Merger of transportation systems with adjoining districts, contracting out of the transportation system, transportation systems operated at the regional service district level, all come to mind and all are worthy of further investigation. The public school district is an educational system; it is not designed to be, and is apparently is not very economically effective at being, a public transportation system. More investigation should go into economically-efficient means of moving students from place to place.

Unit districts classified as technically inefficient reported the highest average mobility rate and the lowest average attendance rate. Conversely, the technically efficient unit district had the lowest average mobility rate and the highest average attendance rate. This melancholy finding illustrates once again that factors external to the control of the school superintendent and of the school board often determine why the district is, or is not, economically-efficient. Further commentary on this important point occurs in the policy implications section of this study.

The ratio of interest-owed to revenue could only be calculated for the year 1986, due to the lack of availability of information needed. In the case of high-service districts, it was found that they borrow more than the other districts to provide services to their students. Their ratio is over two times that of the technically-efficient districts and over three times the size of the low-service districts. The districts with the money will spend more; that is a given. However, what is seen here is not that these districts are spending the maximum they have available, but that these districts are going into debt to provide services that they normally would not have the funds to provide. Boards, particularly in the northeastern part of the state, appear to be borrowing heavily to sustain the high service levels they are providing. It may well be that in this part of the state the school boards are not governed by the fiscal conservatism found downstate and are borrowing to invest; that is, making money on the interest spread. Some serious policy questions emerge at once: Is borrowing really an economically-efficient way to sustain a professional effective school? Cannot professionally effective schools be maintained by normal taxation? If the public will not tax enough to maintain a professionally effective school, should the local board take upon itself the heavy responsibility of borrowing to sustain that high level of professional services? This obviously needs further investigation, and quickly.

For the years 1986 and 1987, it was possible to calculate the ratio of interest-owed to total expenditure. The high-service districts once again registered averages slightly more than twice the same ratio for the technically-efficient districts.

The ratio of the unrestricted grant-in-aid to revenue could only be calculated for the year 1987, due to the lack of availability of information needed. The ratio for the low-service districts was the highest, almost one-third more than that of the Technically Inefficient districts. The technically-efficient districts were slightly behind that of the low-service districts. The ratio of the average general state aid to revenue presented the same results as that of the single year. Thus, the source of funding, state vs. local, does not appear to play a major role in determining economic efficiency, but this too might deserve further investigation.

The ratio of the average total instructional aid to revenue had the high-service quadrant reporting the highest ratio, but only slightly different than that of the technically-inefficient districts. This was disappointing because it was hoped that it could be shown that districts concentrating more of their budget upon instruction could be shown to be more economically-efficient. Such was not to be the case, at least for this investigation. However, the reader should note the findings on Ward's basic education ratio, cited below.

When considering geographic regions of the state, one finds the following types of districts in the specific region cited:

- o Northern - - - - - - - - - - > High Service
- o Central - - - - - - - - - - > Technically Efficient
- o Southern - - - - - - - - - - > Low Service

Taking into consideration the general economic make-up of the state, a logical pattern is presented here. In Illinois, a predominance of the wealth of the state is located in the Northeastern section of the state. As one progresses to the south and west the concentration of wealth diminishes rapidly.

When considering the community type that the district is located in, one finds the following pattern of dispersal in the quadrants:

- o Central City - - - - - - - - - - > High Service
- o Suburban - - - - - - - - - - > High Service
- o Small City - - - - - - - - - - > Technically Efficient
- o Rural - - - - - - - - - - > Low Service
  Technically Efficient

Urban concentrations in the state are found, generally, in the North and Central regions. The only substantial urban concentration in the southern part of the state is found opposite St. Louis. The centers would be East St. Louis, Granite City, Woodriver, and Alton. Large urban school districts are not well presented in the economically-efficient quadrant.

In using the average basic education ratio, the picture as to the location of districts in quadrants is:

- o Above Average - - - - - - - - - - > Technically Efficient
- o Below Average - - - - - - - - - - > Low Service

The fact that Ward's basic education ratio is highest for the technically efficient districts does support the theory advanced by some that expenditures which are not so directly related to instruction do detract from overall economic efficiency of the public schools. However, as previously stated,it was not possible to confirm that hypothesis directly with the funds spent on instruction. Further investigation is again warranted.

Collectively, the results of the Chi-square analysis might be used to categorically describe a typical school district as found in each of the four quadrants. The following, more global conclusions might be offered concerning the unit school districts in Illinois:

Technically-Efficient districts tend to be located more in the central part of the state; they have an above average basic educational spending ratio, and they are either small cities or rural.

Low-Service districts seem to be found more in the southern part of the state. They tend to be rural community types. The relative size of their basic educational ratio does not seem to enter into the decision since there is an even number of districts above and below the average value for the ratio.

High-Service districts are found mostly in the northern part of Illinois. They have above average basic education ratios and they will be located either in the central city or the suburbs.

Technically-Inefficient districts, again, are found mostly in the central part of the state. The value of the basic education ratio is above average. As for community type, they are probably rural.

From these specific results the following overall conclusions were drawn. The central part of Illinois has a disproportional concentration of technically-efficient districts while simultaneously containing a number of inefficient districts. Small cities, as opposed to large cities, and in further contrast to suburbs or rural areas, seem to hold the most cost-effective and economically-efficient districts in the state. When considering size, neither the large districts nor the small districts tend to be cost-effective; it is the middle-level school districts that are economically-efficient. The mean size of the cost-effective unit districts is 1724 students.

Unfortunately, there was a failure to determine those internal budget allocations which have an effect on placing a school district in a cost-effective position with regard to other districts in the state. It was hoped that some pattern of budget allocations might be exhibited by technically-efficient districts. It was further hoped that having identified those desirable ratios, one could analyze how the monies were dispersed in order to arrive at that ratio value. If the questionable district could possibly spend their monies on similar ones, then perhaps the problem of efficiency could be resolved for the troubled district.

More specifically, that portion of the budget containing the educational fund failed as a determiner of cost-effectiveness. Despite the failure of this study to specify significant categories of cost, this does not negate the possibility of a more detailed cost analysis study pinpointing allocation patterns that contribute to economic efficiency. However such studies will have to use something more detailed than simple fund balances, and the other standard financial categories that were used in this study.

Another unfortunate finding of this study was that conditions external to the school and beyond the control, for the most part, of administrators determines whether or not the school district will be cost-effective. High percentages of low income students, high student mobility coupled with low attendance history, and high transportation costs--all seem to be characteristics associated with economically inefficient districts.

It is to be emphasized that the quadriform is still a highly experimental technique. At the time of writing this monograph, it had been used sucessfully in only two doctoral dissertations at Illinois State University and in one additional study at the University of Michigan. Attention is now directed to the study at the University of Michigan since a comparison of the two studies is instructive and suggestive for further research.

Anderson, Kearney, and Mora were able to achieve a totally independent replication of the ISU study and to make some improvements on the quadriform approach. In the first place, the Michigan analysis was able to use state-wide achievement data rather than the ACT scores--an improvement since there are many limitations with using ACT scores. Second, and most important, the Michigan investigators had available to them data on curricula throughout the State of Michigan that could be related to economic efficiency. (We are now exploring the possibility of using the "census of course offerings" in Illinois for the same purpose, but those results are not reported in this monograph.) The Michigan team also used a discriminate function on the crucial "post quadriform" part of the study and that may well be an improvement over the use of the simple ANOVA and Chi Square type of analysis used in Illinois.

The results of the Michigan study are both encouraging and disappointing. Encouraging, in that the Michigan effort helps to sustain the belief that the quadriform is a viable taxonomic or classification system; but disappointing in that the Michigan effort, like the Illinois effort, still points to factors external to the school, and largely beyond the control of school administrators which are the primary determinants of economic efficiency of the public schools. The Michigan team, for example, found that the most inefficient districts had the highest percentages of minority children and had the highest dropout rates. In Michigan, efficient districts tend to be found in more rural areas. In Illinois, by contrast, it was the small cities that were the most efficient, while large urban districts and some very small rural districts tended not to be efficient.

In Michigan, size did not seem to be an important variable; in Illinois, the middle-level-enrollment districts appear to be more efficient than the very large or the very small. Most important, the Michigan study found that a district which offered a high percentage of courses in the "core area" of the curricula tended to be an economically-efficient district. Illinois has yet to investigate the relationship of course offerings to economic efficiency, at least by means of the quadriform. It would appear that those who advocate a "back to basics" approach to public education would wish this connection between course offerings and economic efficiency invested in some detail.

VI. Limitations on the Procedure

There are many limitations on this procedure. So many, in fact, that not much progress was made to the limitation which were outlined for the other procedures concerning economic efficiency that have been previously discussed. First, the whole analysis rests on state-wide standardized test scores. That is true of most of the other procedures used in economic efficiency studies, as well. It can surely be correctly charged that standardized test scores do not, and can never, capture the full output of the schools; therefore, the test of economic efficiency is, ipso facto, partial, at best. If

there is no acceptable measure of output available, there can never be a way to ascertain economic efficiency; however, that cannot be an acceptable answer to taxpayers or to their representative in state legislatures around the country. Second, a known fact is that there has been considerable "creative management" of which students take these standardized tests and which students do not take these tests from year-to-year in school districts. Keeping away some of the low-scoring students on the test day would tend to raise the results over time and to provide a fair amount of error variance in the residuals upon which this analysis is based, as well. There is not much that can be done about this except to plead for greater policing of the manner in which the tests are administered at the local level. It might be possible to increase the standard error of estimate, and to require the district to be in the quadrant for more years; that might adjust for test administration differences around the state.

A much tougher question is whether economic efficiency might be sought at the expense of professional effectiveness. Practicing administrators to whom this approach has been presented often answer in the following vein: "Yes, I can make my school district look good on your indicators. All I have to do is increase my pupil/teacher ratio, thereby lowering my cost per student, and, at the same time, cut back on my course offerings so that I concentrate upon what the state is testing. If I do both of these things, my test scores will likely rise and my costs will likely drop. Then, I will be in the upper left hand part of your design and you will be congratulating me on running an economically-efficient school district in Illinois." But at what result in terms of professional effectiveness? Less will be taught, though it may be taught better at lower cost. Obviously, one cannot proceed in this area very far without more examination of the breadth and depth of the curricular offerings, and some articulation with the notion of "effective" schools.

This section ends on a note which was sounded earlier in the monograph. Economically-efficient schools may not turn-out to be professionally effective schools. It is a major, ethical dilemma for the professional educator, but it is surely not foreign to anyone who serves in the public sector. One can almost hear the hospital administrators saying, "Welcome to the club, old boy. What took you so long?"

VII. Further Research

Having established a viable procedure for identifying Technically Efficient school districts, school finance research now has the capability to compare the districts in each of the four quadrants of the quadriform created. Any quantitative variable, interval or discrete, that is a characteristic of a public school district can be investigated in terms of the quadriform.

The following recommendations are made for further research:

1. The ACT's main asset is in the prediction of future academic success in college. For that reason it is somewhat limited in a role as a measurement of academic achievement. As the state moves closer to having new norm-referenced and criterion-referenced tests statewide, it would be advisable to investigate the use of these achievement tests in place of the ACT.

2. Much money is expended in the area of special education. In some instances, the special education staffs are larger than the math and English departments of a given school. Payments made to districts by the various governmental agencies is usually a year behind and not for the total amount of monies spent by the district. Future investigations might take into account monies spent by the districts on special education and the location of that district in the quadriform.

3. The relative efficiency of unit, elementary, and high school districts may also be investigated by means of the quadriform although this would be greatly complicated by the lack of comparable test scores between the different kinds of districts and the inability to compare costs on some standard basis.

4. The instructional cost ratios and the values need to be refined. It seems that the expenditure percentages were too crude, or all encompassing, to yield good results. An example would be in the operations and maintenance fund or the life safety code expenditures. One might ask whether or not the district is using its own workers and materials to perform repairs and facilitate compliance with codes or whether or not it contracts out that type of work, and then see how that affects placement in the quadriform.

5. A closer look might be taken at those districts located in the "Voided Cross." More specifically, the excluded areas in each individual quadrant might be studied.

6. Of very great importance would be the investigation of the effect of both curricular variables and personnel variables on the position of a school district in the quadriform. Measurements such as "scope and width of curriculum" as well as some of the more obvious personnel variables, such as "pupil/teacher ratio" should be investigated for their possible role as a determinant of technical efficiency. As noted above the Michigan study points very strongly in this direction. Investment in the training and experience of teachers might be explored to determine the cost-effectiveness of hiring teachers with more experience and greater training. A variable of considerable importance might be the extent to which districts utilize teachers aides.

7. The overall homogeneity of the population might also have some impact on the results of a study of the present design. The less diversity in the population, the more focused the population on increasing student achievement. The study could then investigate the spending patterns that more clearly represent the community and not a compromise. Hopefully, crucial spending patterns can then be identified.

8. Twelve counties had 50 percent or more of their unit districts placed in the technically-efficient quadrant. Perhaps it would be beneficial to investigate those counties and districts to determine what characteristics are common to the districts.

9. Any further replication of the quadriform might include, in the definition of technically efficient, the actual expenditure per pupil rather than the expected expenditure, as given by the regression equations. However, such a change would make a major shift in the research design since it would remove the frugality factor from the design.

10. As subsequent data become available and researchers wish to include such data into a replication of this study, a sliding average should be used. That is to say, the averages used should be recalculated including the new data. In so doing, instability in the yearly residuals would be dealt with.

11. Since the ultimate decision as to how monies are spent lies with the local school boards, it would seem logical that some form of investigation could be made into the general "makeup" of the board and their attitudes toward the superintendent and their philosophies, especially the fiscal attitudes held by the board members and the strength with which board members value "economic efficiency." The board "in power" might not be the board that hired the existing superintendent; the board might have inherited the philosophies of a previous group. How any of this might effect economic efficiency, if indeed it does, is not now know.

12. The presence or absence of a full-time school business manager, or an assistant superintendent in charge of business, may affect the location of the school district in the quadriform. Certainly, conventional wisdom holds that provision for a full-time business manager should result in greater economic efficiency of the school district, and the quadriform can be used to investigate that hypothesis.

13. Finally, the curvilinear nature of the size variable needs further investigation. While there are many studies which show middle-level rather than large or small districts to be most economically-efficient in terms of simple expenditures per pupil, the quadriform approach might also cast light upon this alleged superiority of middle-level districts. These investigations would be of use in consolidation studies.

VII. Policy Implications

Allocations of resources within a district among the many programs and mandates is accomplished through a series of decisions and policy implementations. The basic policy is, of course, established by the local board of education to meet the needs of the district and the mandates of the state. Board control of costs is, of course, modified by the fact that salaries and benefits are negotiated.

When this study was first conceptualized, it was hoped that financial ratios could be identified that influenced the positioning of a given local school district with respect to its effectiveness. That task was not successfully completed. The Illinois State Board of Education would not be justified, therefore, in recognizing school districts as cost-effective and economically-efficient, and subsequently rewarding them for attaining that status, without citing the exogenous variables that contributed to their designation. One can readily see, for example, that it would be a miscarriage of justice if a district was labeled as being inefficient based on demographic variables over which it had little, if any, control. On the other hand, the findings with regard to the central part of the state, where many cost-effective schools appear to be located, the superiority of the small city district relative to economic efficiency and the desirability of middle-level size, all point to areas where the reasons for cost-effectiveness in the State of Illinois can be further explored. Therefore, the State Board of Education should not consider any program of reward for those districts designated as cost-effective until indogenous variables, controllable by local administrations, can be isolated and emulated by other districts in the state.

The very difficult task of finding variables controllable by the board and administration must go forward. Admittedly, in a sense, this attempt failed to by-pass the difficulties encountered by Coleman, Hanushek, Walburg, and others. This study was not able to find controllable school variables that could be manipulated to bring about greater economic efficiency. Either the external school influences are even greater than was expected; or the estimation models are still too inexact; or, more likely, important variables like curricula and personnel factors were not included in the design. But, it is far too early to declare a defeat; there are a number of hopeful avenues for productive research in the future. The authors continue to believe that the quadriform holds more hope than some other investigative techniques that have been used in the past.

This monograph concludes by looking briefly at the constitutional implications of this study. However, before continuing, it must be pointed out that this research was not intended nor designed as a legal study, certainly not along the lines of the extensive and comprehensive legal publications accomplished by David Franklin for the Center as an important part of the MacArthur/Spencer series. What is commented on herein will only scratch the surface of an extremely complex, legal subject. The constitutional implications originate in the fact that each state constitution contains an article on public education and that in many of these state constitutions the state is mandated to provide a "thorough and efficient" educational system. Though the wording will vary from state constitution to state constitution, the "T&E" phrase (lawyer shorthand notes) was clearly copied from one nineteenth century state constitution to another nineteenth century state constitution throughout the United States, and survives, in some form or another, in each of them at the close of the twentieth century.

Throughout the 1970s and the early 1980s, the "T&E" phrase was subjected to sporadic litigation. However, only in 1989 and 1990, in three important cases (Edgewood v. Kirby, 1989; Rose v. The Council, 1989; and Abbot v. Burke, 1990) has it really come into its own. The supreme courts of Texas, Kentucky, and New Jersey have all struggled with a definition of "efficiency" in public education. For Illinois, the importance of this fact comes to light when one takes notice of the fact that the second sentence in the education article (Article Ten) of the 1970 Illinois Constitution reads as follows: "The state shall provide an EFFICIENT system of high quality education." This sentence has yet to stand the test of the courts in Illinois, and, because of this fact, no one knows what construct the courts might impose on it. The statement does exist; and, given the developments in the State of Illinois at the present time, it is almost a certainty that it will shortly be tested, in some form, through litigation.

The litigable implications of this particular study arise directly from the New Jersey case, Abbot v. Burke. On June 5, 1990, Chief Justice Robert Wilentz, writing for a unanimous court, found that the urban schools of New Jersey were neither "thorough" nor were they "efficient," and ordered the legislature to remedy the situation in a reasonable length of time. A plaintiff in the State of Illinois could argue from the results of this study that urban school districts in Illinois are also not economically-efficient; and, further, that this lack of efficiency must likely be related to the conditions found to be associated in this study with low economic efficiency--that is, high concentrations of pupils from low income families, high student migration, and poor attendance records. Given the low test scores in many Illinois urban districts, it would not be much of a strain for such a plaintiff to go on from that point to also argue that urban districts in Illinois are neither "efficient" nor do they provide "high quality education"; and, therefore, these school districts are currently in violation of the mandate of Article X. The real problem now clearly comes to light. Suppose that these large urban districts are in violation of the "T&E" phrase in Article X, what "remedy" can the courts of the State of Illinois propose so that the problem can be rectified? It cannot be the same remedy proposed in

Abbot v. Burke, because many of the large urban districts are already spending at levels approximately equal to the wealthy suburbs and that was all that Chief Justice Wilentz ask of the State of New Jersey. If it is necessary to spend more in urban districts than is spent in suburban districts in order to raise test scores, how can that do anything but drive the urban districts further into economic inefficiency, unless that additional spending results in sharply increased test scores in the large urban districts? Any attempt to follow through on these complicated legal and policy matters, at this time, would take us far from the original purpose of this research endeavor. However, perhaps the research procedures and design presented in this study might have a bearing on future litigation concerning the "T&E" phrases in the Illinois State Constitution, as well as in others. We take leave of the reader with that thought in mind.

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APPENDIX A

Means of Financial Ratios Tested by Quadrant

Financial Ratios Tested in the ANOVA	Overall Means	Technically Efficient QUAD=1	Low Service Districts QUAD=2	High Service Districts QUAD=3	Technically Inefficient QUAD=4
Avg. Per Capita Tuition Charge	2772.00	2537.00	2459.00	3177.00	3137.00
Avg. % Trans. Fund	6.56	6.08	6.98	6.22	6.15
Avg. % Site-Const. Fund	2.19	2.44	1.88	2.97	1.85
Avg. % Rent Fund	.06	.04	.04	.11	.12
Avg. % Operating Main.	8.95	9.35	8.87	8.34	9.17
Avg. % Municipal Ret.	1.69	1.67	1.69	1.68	1.68
Avg. % Education Fund	75.04	75.67	75.16	73.92	75.26
Avg. % Capital Improv.	.01	.001	.01	.004	.00
Avg. % Bond & Interest	5.51	4.76	5.37	6.76	5.79
Avg. Unrestricted Grant-in-Aid/Rev. (86-87)	.35	.38	.39	.31	.30
Avg. Total Inst. Aid/Rev.	.04	.04	.03	.05	.04
(Avg. Federal Subsidies – Lunch)/Revenue	.04	.03	.04	.04	.04
Avg. Gen. State Aid/Rev.	.35	.38	.39	.31	.30
Avg. Assets/ Liabilities in Gen Fund	1318.00	3529.00	105.00	1507.00	144.00
Avg. Assets/ Liabilities in Edu. Fund	1252.00	2963.00	139.00	1625.00	190.00
Avg. Interest Owed/Rev.	.13	.12	.07	.25	.15
Avg. Int. Owed/Total Exp.	.13	.1136	.0725	.2503	.1534
Avg. Total Instructional Expenditure/Revenue	.68	.6778	.6663	.6909	.6917
Avg. Total Instructional Expend/Total Expend	.67	.6699	.6608	.6632	.6627
Operating Exp. Per Pupil/ Per Capita Tuition Charge	1.16	1.16	1.17	1.15	1.16
Avg. % Dist. Gen Edu.	20.77	20.69	20.63	21.53	21.91
Avg. Dist. Enrollment	2722.00	1724.00	1023.00	3084.00	9001.00
Avg. No. Test Takers Planning College	72.00	57.00	30.00	109.00	167.00

APPENDIX B

ANOVA Table of Significant Variables

Quad = 1 to 4 Variable	F-Ratio	F-Prob	Variable Title
ACOMP	76.9864	.0000	Average ACT composite score
APCTC	60.0472	.0000	Average per capita tuition charge
APTRAN	2.7461	.0434	Average percent of transportation fund
AMOBI	4.2363	.0060	Average percent district mobility
AATTR	4.3665	.0051	Average percent district attendance
ADOEPP	87.2859	.0000	Average district operating expend. per pupil
UGAPR7	4.3527	.0052	(Unrestricted grant-in-aid)/revenue
ATIAPR	4.2323	.0061	(Average total inst aid)/revenue
AGAPR	4.3038	.0055	(Average general state aid)/revenue
AINTPR	5.2838	.0015	(Average interest owed)/revenue 1986-87
AINOPTE	5.0775	.0020	(Average interest owed)/total expend 1986-87

Means of Variables Used in Regression Equation Determination by Quadrant

Variables Used in Regression Equation	Overall Means	Technically Efficient QUAD=1	Low Service Districts QUAD=2	High Service Districts QUAD=3	Technically Inefficient QUAD=4
Average District ACT Composite	18.78	19.77	17.82	19.81	17.38
Average Operating Expenditure per Pupil	3197.00	2909.00	2863.00	3535.00	3621.00
Average District Attendance	14.61	13.51	13.94	15.56	16.64
Average District Attendance	95.16	95.35	95.27	94.91	94.90
Average District Percent Low Income	19.80	19.65	20.72	19.83	22.96
Average Percent Dist. Vocational Education	29.46	30.54	28.82	26.60	30.05
Average Percent Dist. College Prep	50.00	48.78	50.55	51.87	48.04
Average Number in District Taking Test	56.87	70.00	40.00	128.00	209.00
Average Percent Dist. Class Taking Test	89.00	57.97	57.81	57.49	55.90

APPENDIX C

Follow-up Tests for Significant Variables in Regression Equation and for Significant Difference Between Quadrants

Variables in Question	Scheffe	Tukey-HSD	LSD
Average District ACT Composite	4 & 1, 3 2 & 1, 3		
Average District Vocational Education			3 & 1
Average Percent District Mobility	1 & 4	1 & 4 2 & 4	1 & 3, 4 2 & 4
Average District Operating Expenditure Per Pupil	2 & 4, 3 1 & 4, 3	2 & 4, 3 1 & 4, 3	2 & 4, 3 1 & 4, 3
Average District Attendance Rate		4 & 1 3 & 1	4 & 2, 1 3 & 2, 1
Average Per Capita Tuition Charge	2 & 4, 3 1 & 4, 3		
Average Percent District Transportation Fund			1 & 2 2 & 4, 3
Average Percent Dist. Site-Construction Fund			2 & 3
Average Percent Operating-Maintenance Fund			3 & 1
Average Bond and Interest Fund			1 & 3
Average Unrestricted Grant-in-Aid/Revenue	4 & 2	4 & 1, 2	4 & 1, 2 3 & 1, 2
Average Total Instructional Aid/Revenue	2 & 3	2 & 3	2 & 4, 3 1 & 3
Average Assets/Liabilities in General Fund			2 & 1
Average Interest Owed/Revenue	2 & 3 1 & 3	2 & 3 1 & 3	2 & 3 1 & 3
Average General State Aid/Revenue		4 & 1, 2	4 & 1, 2 3 & 1, 2
Average Interest Owed/Total Expenditure	2 & 3 1 & 3	2 & 3 1 & 3	2 & 3 1 & 3

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Follow-up Tests for Significant Variables in Regression Equation and for Significant Difference Between Quadrants

Variables in Question	Scheffe	Tukey-HSD	LSD
Average District ACT Composite	4 & 1, 3 2 & 1, 3		
Average District Vocational Education			3 & 1
Average Percent District Mobility	1 & 4	1 & 4 2 & 4	1 & 3, 4 2 & 4
Average District Operating Expenditure Per Pupil	2 & 4, 3 1 & 4, 3	2 & 4, 3 1 & 4, 3	2 & 4, 3 1 & 4, 3
Average District Attendance Rate		4 & 1 3 & 1	4 & 2, 1 3 & 2, 1
Average Per Capita Tuition Charge	2 & 4, 3 1 & 4, 3		
Average Percent District Transportation Fund			1 & 2 2 & 4, 3
Average Percent Dist. Site-Construction Fund			2 & 3
Average Percent Operating-Maintenance Fund			3 & 1
Average Bond and Interest Fund			1 & 3
Average Unrestricted Grant-in-Aid/Revenue	4 & 2	4 & 1, 2	4 & 1, 2 3 & 1, 2
Average Total Instructional Aid/Revenue	2 & 3	2 & 3	2 & 4, 3 1 & 3
Average Assets/Liabilities in General Fund			2 & 1
Average Interest Owed/Revenue	2 & 3 1 & 3	2 & 3 1 & 3	2 & 3 1 & 3
Average General State Aid/Revenue		4 & 1, 2	4 & 1, 2 3 & 1, 2
Average Interest Owed/Total Expenditure	2 & 3 1 & 3	2 & 3 1 & 3	2 & 3 1 & 3

APPENDIX D

Crosstabulations of the Ratio of a District Operating Expenses Per Pupil to Per Capita Tuition Charge

Count Row Percent Col. Percent	Technically Efficient QUAD=1	Low Service Districts QUAD=2	High Service Districts QUAD=3	Technically Inefficient QUAD=4	Row Total
Above Average	44 28.4 58.7	38 24.5 50.0	40 25.8 64.5	133 21.3 60.0	155 57.8
Below Average	31 27.4 41.3	38 33.6 50.0	22 19.5 35.5	22 19.5 40.0	113 42.2
Column	75	76	62	55	268

Crosstabulations of Regions in State by Quadrant

Count Row Percent Col. Percent	Technically Efficient QUAD=1	Low Service Districts QUAD=2	High Service Districts QUAD=3	Technically Inefficient QUAD=4	Row Total
North	19 24.4 25.3	12 15.4 15.8	21 41.0 51.6	15 19.2 27.3	78 29.1
Central	39 32.8 52.0	38 31.9 50.0	15 12.6 24.2	27 22.7 49.1	119 44.4
South	17 23.9 22.7	26 36.6 34.2	15 21.1 24.2	13 18.3 23.6	71 26.5
Column	75	76	62	55	268

Crosstabulations of Community Type in State by Quadrant

Count Row Percent Col. Percent	Technically Efficient QUAD=1	Low Service Districts QUAD=2	High Service Districts QUAD=3	Technically Inefficient QUAD=4	Row Total
Central City	2 18.2 2.7		6 54.5 9.7	3 27.3 5.5	11 4.1
Suburban	10 24.4 13.3	7 17.1 9.2	14 34.1 22.6	10 14.4 18.2	41 15.3
Small City	23 47.9 30.7	12 25.0 15.8	9 18.8 14.5	4 8.3 7.3	48 17.9
Rural	40 23.8 53.3	57 33.9 75.0	33 19.6 53.2	38 22.6 69.1	168 62.7
Column	75	76	62	55	268

APPENDIX E

LOCATION IN QUADRANT BY COUNTY

No.	County	N[a]	Quad I	Quad II	Quad III	Quad IV
001	Adams	5	1	1		
002	Alexander	2			2	
003	Bond	2		1		
004	Boone	2	1			
005	Brown	1				
006	Bureau	6	2	1		1
007	Calhoun	1			1	
008	Carroll	5			1	2
009	Cass	4		3		
010	Champaign	6	3			1
011	Christian	8	1	1		4
012	Clark	2		1		
013	Clay	3		2		
014	Clinton	2		2		
015	Coles	3			1	
016	Cook	2				2
017	Crawford	4	1	1		
018	Cumberland	2				
019	DeKalb	10	1		5	1
020	DeWitt	2				1
021	Douglas	5		1		1
022	Dupage	6				1
023	Edgar	4	2	1		1
024	Edwards	1				
025	Effingham	5	1	1		
026	Fayette	5		2	1	
027	Ford	4	1		1	
028	Franklin	3				
029	Fulton	6	2	1		
030	Gallatin					
031	Greene	3	2			
032	Grundy	2				
033	Hamilton	1				
034	Hancock	8	4		1	
035	Hardin	1				

(table continues)

No.	County	N[a]	Quad I	Quad II	Quad III	Quad IV
036	Henderson	2	1			
037	Henry	8	5	2		
038	Iroquois	7	1	2		3
039	Jackson	4	1		2	1
040	Jasper	1				
041	Jefferson	1	1			
042	Jersey	1				
043	Jo Daviess	5			2	1
044	Johnson					
045	Kane	9		1	4	
046	Kankakee	5		2		1
047	Kendall	3	1			
048	Knox	5	1	1		
049	Lake	5			2	
050	LaSalle	4				1
051	Lawrence	2		1		1
052	Lee	4	1	1		
053	Livingston	3				2
054	Logan	2			1	
055	Macon	8	1	4		
056	Macoupin	9	2	3		1
057	Madison	11	1	1	1	4
058	Marion	3	1	2		
059	Marshall	3			1	3
060	Mason	6	1		2	
061	Massac	1				
062	McDonough	5		1	1	2
063	McHenry	5			1	1
064	McLean	11	1	1	2	5
065	Menard	3	1	1		
066	Mercer	3		1		
067	Monroe	3	1			
068	Montgomery	5	2		2	
069	Morgan	5	1	1		1
070	Moultrie	3		1		
071	Ogle	7	3		2	
072	Peoria	8	2	2	2	1
073	Perry	1		1		
074	Piatt	5	1	3	1	
075	Pike	5	1		1	

(table continues)

No.	County	N[a]	Quad I	Quad II	Quad III	Quad IV
076	Pope	1				
077	Pulaski	2			2	
078	Putnam	1		1		
079	Randolph	5		1		1
080	Richland	2	1	1		
081	Rock Island	4			2	
082	St. Clair	8	1	1	2	2
083	Saline	4			1	
084	Sangamon	12	6	2	1	1
085	Schuyler	1		1		
086	Scott	2	1			
087	Shelby	5	1	3		1
088	Stark	2		1		
089	Stephenson	5	2		2	
090	Tazewell	4	1	1		
091	Union	3		2		1
092	Vermilion	9	1	3		2
093	Wabash	1	1			
094	Warren	5	2			1
095	Washington	1		1		
096	Wayne	2			1	
097	White	3		2		1
098	Whiteside	6	3		1	
099	Will	7		1	1	2
100	Williamson	5	1	1		1
101	Winnebago	6		1	3	
102	Woodford	5		2		

[a]N = number of Unit School Districts in the county

APPENDIX F

UNIT SCHOOL DISTRICTS IN ILLINOIS GROUPED BY QUADRANT
FOR 1986-1989 (NOT INCLUDING THE "VOIDED CROSS")

Quadrant I: Technically Efficient

Alexis Community Unit School District 400
Altamont Community Unit School District 10
Annawan Community Unit School District 226
Arcola Community Unit School District 306
Astoria Community Unit School District 1
Auburn Community Unit School District 10
Ball Chatham Community Unit School District 5
Belvidere Community Unit School District 100
Byron Community Unit School District 226
Cambridge Community Unit School District 227
Canton Union School District 66
Carlinville Community Unit School District 1
Carrollton Community Unit School District 1
Carterville Community Unit School District 5
Central Community Unit School District 4
Danville Consolidated Community School District 118
Decatur School District 61
Depue Unit School District 103
Dunlap Community Unit School District 323
East Richland Community Unit School District 1
Edgar County Community Unit District 6
Elmwood Community Unit School District 322
Fisher Community Unit School District 1
Forrestville Valley Community Unit School District 221
Freeport School District 145
Galesburg Community Unit School District 205
Geneseo Community Unit School District 228
Gibson City Community Unit School District 1
Greenfield Community Unit School District 10
Hancock Central Community Unit District 338
Havana Community Unit School District 126
Highland Community Unity School District 5
Hillsboro Community Unit School District 3
Jacksonville School District 117
Kewanee Community Unity School District 229

Kinmundy Alma Community Unit School District 301
Laharpe Community Unit School District 335
Lebanon Community Unit School District 9
Lee Center Community Unit School District 271
Lena Winslow Community Unit School District 202
Mahomet-Seymour Community Unit School District 3
Monmouth Unit School District 38
Monticello Community Unit School District 25
Morrison Community Unit School District 6
Morton Community Unit School District 709
Nauvoo-Colusa Community Unit School District 325
Nokomis Community Unit School District 22
Normal Community Unit School District 5
Oswego Community Unit School District 308
Palestine Community Unit School District 3
Paris-Union School District 95
Pawnee Community Unit School District 11
Payson Community Unit School District 1
Pikeland Community Unit School District 10
Polo Community Unit School District 222
Porta Community Unit School District 202
Prophetstown-Lyndon Community Unit School District 3
River Bend Community Unit District 2
Riverton Community Unit School District 14
Rochester Community Unit School District 3A
Sandwich Community Unit School District 430
Staunton Community Unit School District 6
Taylorville Community Unit School District 3
Tolono Community School District 7
Tri City Community Unit School District 1
Trico Community Unit School District 176
Union Oquawka Community Unit School District 115
Wabash Community Unit School District 348
Waltonville Community Unit School District 1
Warsaw Community Unit School District 316
Waterloo Community Unit School District 5
Western Community Unit School District 306
Wethersfield Community Unit School District 230
Winchester Community Unit School District 1
Windsor Community School District 1